AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT

1. CONTRACT ID CODE	PAGE OF PAGES
J	1 / 7

2. AMENDMENT/MODIFICATION NO.	3. EFFECTIVE DATE	4. REQUISITION/PURCHASE REQ. NO.	5. PROJECT NO.(If applicable)
0003	23-Mar-2004		

6. ISSUED BY CODE N00174	7. ADMINISTERED BY (If other than item 6) CODE
NAVSEA INDIAN HEAD 101 STRAUSS AVE ATTN: KAY PROCTOR 1141W PROCTORKV@IH.NAVY.MIL INDIAN HEAD MD 20640-5035	See Item 6

8. NAME AND ADDRESS OF CONTRACTOR (No., Street, County, State and Zip Code)

CODE | FACILITY CODE

X	9A. AMENDMENT OF SOLICITATION NO. N00174-04-R-0025
X	9B. DATED (SEE ITEM 11) 26-Feb-2004
	10A. MOD. OF CONTRACT/ORDER NO.
	10B. DATED (SEE ITEM 13)

11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS

[X] The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offer [ ] is extended, [X] is not extended.

Offer must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended by one of the following methods:
(a) By completing Items 8 and 15, and returning ______ copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

12. ACCOUNTING AND APPROPRIATION DATA (If required)

13. THIS ITEM APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS.
IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.

A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A.

B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as changes in paying office, appropriation date, etc.) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(B).

C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF:

D. OTHER (Specify type of modification and authority)

E. IMPORTANT: Contractor [ ] is not, [ ] is required to sign this document and return ______ copies to the issuing office.

14. DESCRIPTION OF AMENDMENT/MODIFICATION (Organized by UCF section headings, including solicitation/contract subject matter where feasible.)

SEE THE NEXT PAGE FOR DESCRIPTION

Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.

15A. NAME AND TITLE OF SIGNER (Type or print)		16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print) TEL: EMAIL:	
15B. CONTRACTOR/OFFEROR ______ (Signature of person authorized to sign)	15C. DATE SIGNED	16B. UNITED STATES OF AMERICA BY ______ (Signature of Contracting Officer)	16C. DATE SIGNED 23-Mar-2004

SECTION SF 30 BLOCK 14 CONTINUATION PAGE

The following items are applicable to this modification:

THE ABOVE SOLICITATION IS MODIFIED TO ANSWER QUESTIONS RECEIVED.AND TO REVISE THE REQUIREMENT SPECIFICATIONS.

Question #1:We believe the highlighted velocity specifications above, which are identical to those for Roll B, were inserted in error. The position has limited displacement, and is therefore in conflict with continuous-displacement velocity. As such, this information appears to be relevant to Roll B, not to Roll A. Also, slip rings are normally not required on limited-displacement axes.

Answer: This is valid. Can delete "Velocity Command" portion from Roll A specification. See revision No# 2 specification below. Attachment (1)

Question #1a Further, it is generally not a practical matter to achieve high acceleration with high speed. The drive mechanisms necessary for either are considerably different. See additional comments regarding position capabilities for high-speed axes below.

Answer: The driving factor with AARGM and PGM motion simulation are stresses under performance imparted during terminal manuevering. Thus, the basic flight profile in a simulation environment <u>should be weighted towards satisfying the high acceleration requirements</u> (F=ma). The guidance set under test will need internal data for simulated velocity the flight motion simulator cannot mechanically impart; therefore velocity data shall enter the UUT electronically via the slip ring/telemetry interface. Together, this will exercise the inertial navigation system and still provide a practical overall simulation.

Question #2:It is our experience that roll axes with such high-speed performance do not generally require closed-loop position control. Further, precision position feedback transducers do not generally tolerate, nor indeed operate at, such high-speed motion. Also, the ±120° position displacement limitation for position commands seems inconsistent with an axis that may have continuous-displacement in velocity mode. How does one account for the 120° “dead-band?”

Should not the position performance requirements for Roll B be stricken from the RFP?

Answer: Yes, this portion is deleted. See attachment (1) below.

Attachment (1)

Revision No#2
Requirements Specification
For
THREE AXIS MOTION SIMULATOR

1.0 GENERAL DESCRIPTION

1.1 This specification shall establish the minimum performance, design, fabrication, and turnkey installation requirements for one (1) 3-axis motion simulator (roll, pitch, yaw) to be procured and installed at the U.S. Government's Allegany Ballistics Laboratory in Rocket Center, West Virginia.

1.2 The motion simulator will be used on two families of projectiles, smart gun rounds with the need for high speed roll and missiles with heavier UUTs, a standard inner roll axis, and higher inertial requirements. These requirements are listed as Roll B and Roll A respectively. It is envisioned to have two bolt-on inner roll axis assemblies to accommodate the different UUT requirements.

1.3 The motion simulator shall be of rugged and substantial construction so as to repeatedly perform extended hours of continuous operation.

1.4 The equipment shall be delivered to Alliant Techsystems, Allegany Ballistics Laboratory, 210 State Route 956, Rocket Center, WV, FOB Destination.

1.5 Unless stated otherwise, requirements detailed herein shall be regarded as minimum performance requirements.

2.0 SYSTEM REQUIREMENTS

2.1 MECHANICAL SYSTEM

2.1.1 UUT – (Unit Under Test)

Diameter	5 to 17 inches
Length	10 to 30 inches
Axis Intersection*	8.50 inches
Weight	up to 45 kg (100 lbs)

2.1.2 UUT Initialization Interface Hardware

One articulating armature capable of hosting either an inductive interface or wired connector interface to a common mounting. This interface will initialize the flight guidance system inside the UUT. Prior to initialization, the armature shall firmly position the interface, then after initialization is complete should retract itself clear of the flight motion machinery automatically before flight motion simulation begins. Basic features shall include:

Modularity: The armature shall terminate in a mounting capable of hosting either an electrical connector or inductive interface, each module for which shall be GFE, and not exceed 2.3 kg (5 lbs).

Wiring: The armature shall provide an open conduit for running initialization interface wiring without snags during simulation runs.

Controllability: The armature controls shall integrate with the main control system of the flight motion simulator. Control shall be selectable between manual and automatic. The user interface shall be at the Instrumentation Console.

2.1.3 Motion Simulator Roll (Inner) Axis

ROLL A

SPECIFICATION	Roll A Axis	Pitch Axis	Yaw Axis
Load Weight – 100 lb			
Load Inertia, in-lb-sec ^{2}	.88	40	40
Max. Acceleration, °/sec ^{2}	10,000	5,000	5,500
Max. Velocity, °/sec(RPM)	700	400	200

POSITION COMMAND

Displacement, degrees	±120	±45	±45
Freq. Resp, HZ (-90°Ø,1.0°pp)	30	10.5	11.5
Repeatability, deg. Max	±0.005	±0.005	±0.005
Drift, Max. (1 hour), deg	±0.005	±0.005	±0.005
Threshold, deg	0.0005	0.0005	0.0005
Position Accuracy, Max., deg	±0.053	±0.053	±0.053
Readout Accuracy, Max., deg	±0.053	±0.053	±0.053

Orthagonality of Axes - ±30 arc-sec
Intersection of Axes - ±0.5mm
Distance from axis intersection to rear or the load – 24 inches

ROLL B

SPECIFICATION	Roll B Axis	Pitch Axis	Yaw Axis
Load Weight – 30.3 lb			
Load Inertia, in-lb-sec^2	.45	25.1	25.1
Max. Acceleration, °/sec^2	5,500	5,000	5,000
Max. Velocity, °/sec	21,600(3600)	400	200
POSITION COMMAND			
Displacement, degrees	--	±45	±45
Freq. Resp, HZ (-90°Ø,1.0°pp)	--	10.5	11.5
Repeatability, deg. Max	--	±0.005	±0.005
Drift, Max. (1 hour), deg	--	±0.005	±0.005
Threshold, deg	-	0.0005	0.0005
Position Accuracy, Max., deg	--	±0.053	±0.053
Readout Accuracy, Max., deg	--	±0.053	±0.053
VELOCITY COMMAND			
Displacement, degrees	Continuous	---------	-------
Minimum Velocity,Rev/sec(RPM)	0.6(36)	---------	-------
Velocity Accuracy, %	±1	--------	-------
Freq. Response, Hz(-90°,36RPM/secpp)	10	---------	-------

Slip Ring Load Circuits (Minimum) – 100 @ 2 Amp rating
Noise – 20 milliohms/pair max (100mA current @ 200 RPM)
Dielectric Strength – 500VRMS

2.1.4 Motion Simulator Yaw (Middle) Axis

Drive	Hydraulic or electric actuator
Angular Displacement	±45 degrees
Maximum Torque	3390 N-m (2,500 ft-lbs)
Differential Pressure	140 atm (2000 psid)
Maximum Acceleration	5,000 deg/sec^2 (175 rad/sec^2)
Maximum Velocity	200 deg/sec (3.5 rad/sec)

2.1.5 Motion Simulator Pitch (Outer) Axis

Drive	Dual-vane hydraulic or electric actuator
Angular Displacement	±45 degrees
Maximum Torque	17,700 N-m (13,000 ft-lbs)
Differential Pressure	140 atm (2000 psid)
Maximum Acceleration	5,000 deg/sec^2 (175 rad/sec^2)
Maximum Velocity	400 deg/sec (3.5 rad/sec)

2.1.6 Performance Weighted Design Considerations

For projected units under test (UUTs), the driving motion simulation factors involve stresses under performance imparted during high-speed terminal manuevering. In terms of motion physics, this involves simulating forces from changes of motion best represented by changes in acceleration (ΔForce = UUT Mass X Δ Acceleration). Thus, for resolving velocity vs. acceleration trade-offs, the basic flight profile in a simulation environment <u>should be weighted towards satisfying the high acceleration requirements</u>. The UUT will need internal data for simulated velocity the flight motion simulator cannot mechanically impart; therefore velocity data shall enter the UUT electronically via the slip ring and telemetry interface per the following electrical specifications. Together, this will exercise the inertial navigation system and still provide a practical overall simulation.

2.2 ELECTRICAL SYSTEM

2.2.1 Facility Power Requirements

Instrumentation Console	115 VAC, ±10%, single-phase 50/60 Hz, 10A
Hydraulic Power Supply	440 VAC, ±10%, 3-phase, 60 Hz, 75A/phase (54 KVA), 150 A/phase in-rush

2.2.2 UUT Wires – Simulation Test/Telemetry Interfacing

Type of Cable	Number of Cables	Total Wires
Twisted shielded Pair, 24 AWG	8	16
Twisted pair, 24 AWG	8	16
Twisted pair, 22 AWG	4	8
Shielded wire, 24 AWG	12	12
Unshielded wire, 24 AWG	36	36
CUSTOMER LINES (each)		88

2.3 OPERATING ENVIRONMENT

Temperature	75 degrees ±15 degrees F
Maximum relative humidity	80% (non-condensing)
Non-operating temperatures	-40 to +130 degrees F

2.4 COMPACT RANGE OPTIONS

The following options are for integration into the 3-axis flight motion simulator at a later date. Allowances should be made in the motion simulator design to accommodate these features as future upgrades, if not purchased with this specification. A single construct capable of meeting both performance goals is preferred, however, each should be bid separately unless the technological solution presented combines both.

2.4.1 Compact Infrared Range -– Shall be capable of presenting an infrared representation of between one and several targets along with their simulated surroundings. The IR image presented shall be viewable in visible spectra on the Instrumentation Console, and shall automatically update with respect to the flight motion simulation.

2.4.2 Compact RF Range -- Shall be capable of presenting a radio frequency representation (i.e., simulated seeker radar return) of between one and several targets along with their simulated surroundings. The signal distribution presented shall be viewable to a human user on the Instrumentation Console, and shall automatically update with respect to the flight motion simulation.

2.5 A preliminary review of the proposed equipment is required prior to purchase order award.

2.6 At its earliest opportunity, the Vendor shall provide Allegany Ballistics Laboratory any detailed engineering drawings for the structural foundation required by the flight motion simulator offered. This package shall including electrical and/or pneumatic infrastructure requirements necessary to the flight motion simulator's operations. These should be sent "ATTN: Robert Grazzini" to the delivery address in Section 4.1.

3.0 AUTOMATION INTERFACES

The Instrumentation Console shall have the following automation interfaces for executing flight simulation motions:

3.1 SCRAMNet -– Reflective memory produced by Systran, Inc. (www.systran.com). Two single mode duplex fiberoptic cables are required to interface the Motion Simulator into a greater RDT&E suite.

3.2 Ethernet – 10/100 base T data port only, as a backup automation interface.

3.3 Software – For manual control override, flight motion simulation setup, and simulation control. A Graphical User Interface (GUI) common to a PC workstation is required, with its control memory interfaceable to SCRAMNet and Ethernet, in that order.

4.0 DELIVERY

4.1 Equipment **SHALL BE** delivered and ready for installation 75 days ARO to the attention of Alliant Techsystems, Inc., Allegany Ballistics Laboratory (ABL), 210 State Route 956, Rocket Center, WV.